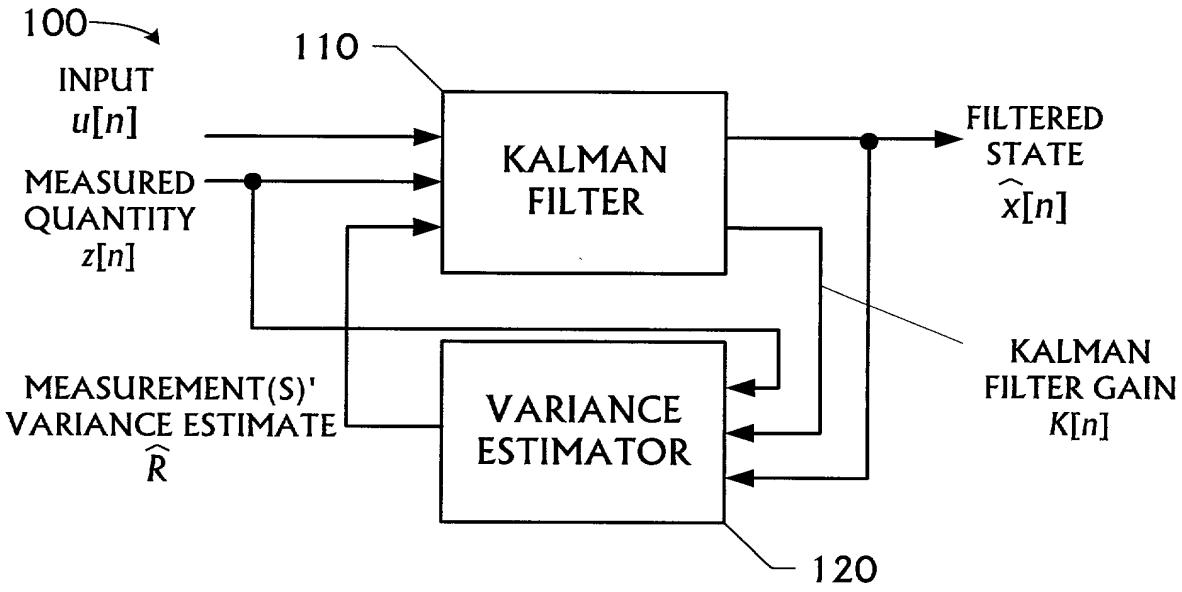
100
110
INPUT
$u[n]$
MEASURED
QUANTITY
$z[n]$
KALMAN
FILTER
FILTERED
STATE
$\hat{x}[n]$
KALMAN
FILTER GAIN
$K[n]$
MEASUREMENT(S)'
VARIANCE ESTIMATE
$\hat{R}$
VARIANCE
ESTIMATOR
120

FIG. 1

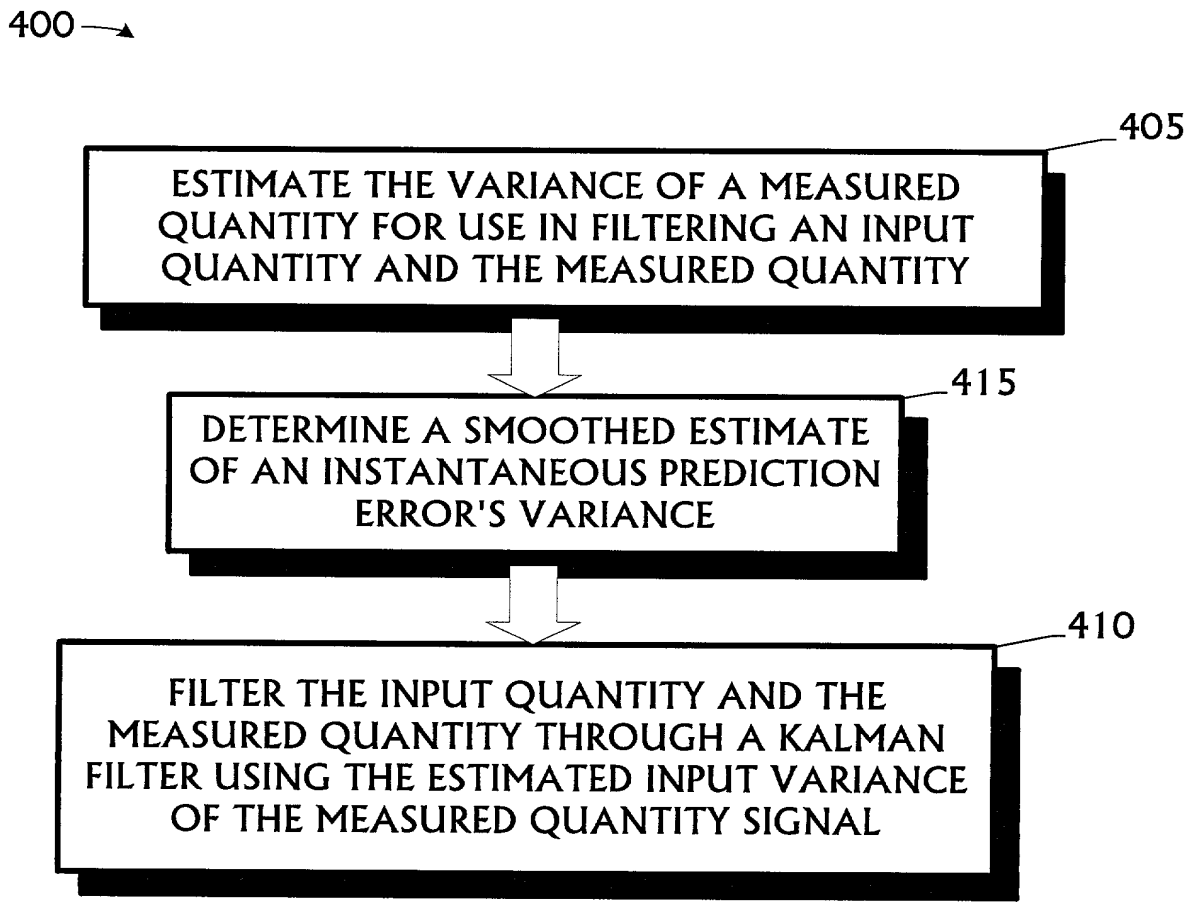
400
405
ESTIMATE THE VARIANCE OF A MEASURED QUANTITY FOR USE IN FILTERING AN INPUT QUANTITY AND THE MEASURED QUANTITY
415
DETERMINE A SMOOTHED ESTIMATE OF AN INSTANTANEOUS PREDICTION ERROR'S VARIANCE
410
FILTER THE INPUT QUANTITY AND THE MEASURED QUANTITY THROUGH A KALMAN FILTER USING THE ESTIMATED INPUT VARIANCE OF THE MEASURED QUANTITY SIGNAL

FIG. 4

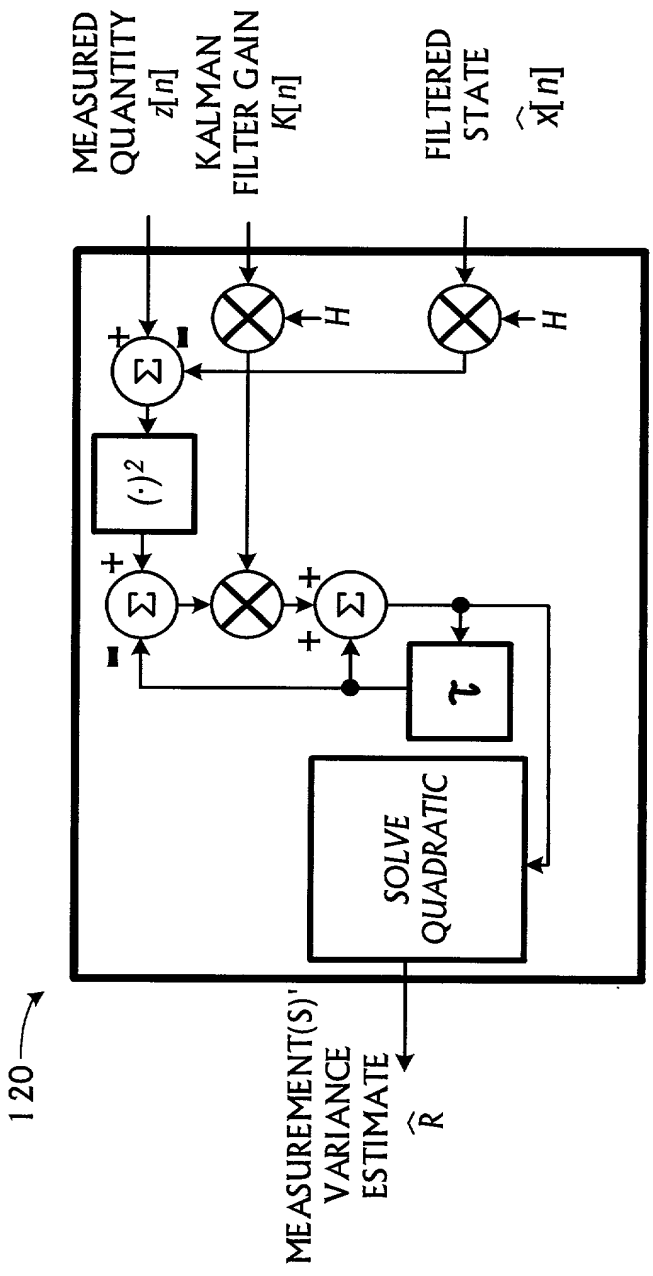
MEASURED QUANTITY z[n]
KALMAN FILTER GAIN K[n]
FILTERED STATE x̂[n]
H
H
Σ
Σ
Σ
(·)²
τ
SOLVE QUADRATIC
120
MEASUREMENT(S)' VARIANCE ESTIMATE R̂

FIG. 2A

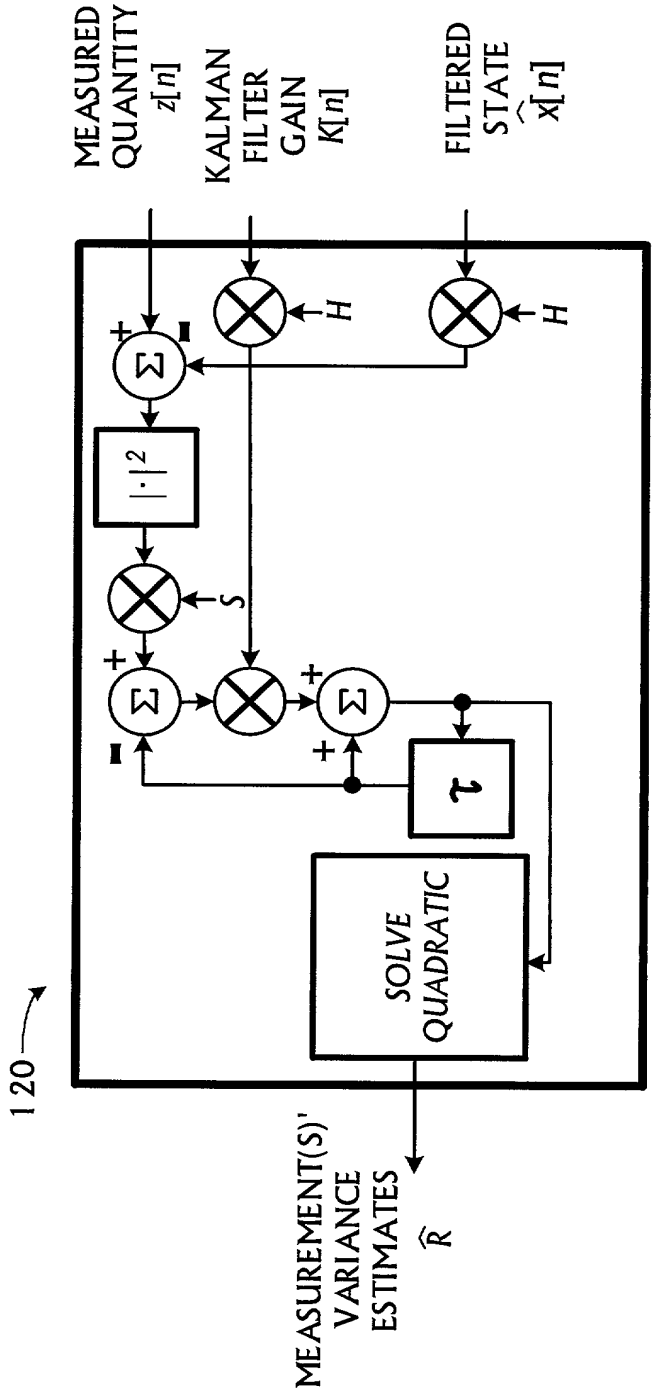
MEASURED QUANTITY z[n]
KALMAN FILTER GAIN K[n]
FILTERED STATE x̂[n]
H
H
Σ
|·|²
S
Σ
Σ
τ
SOLVE QUADRATIC
120
MEASUREMENT(S)' VARIANCE ESTIMATES
R̂

FIG. 2B

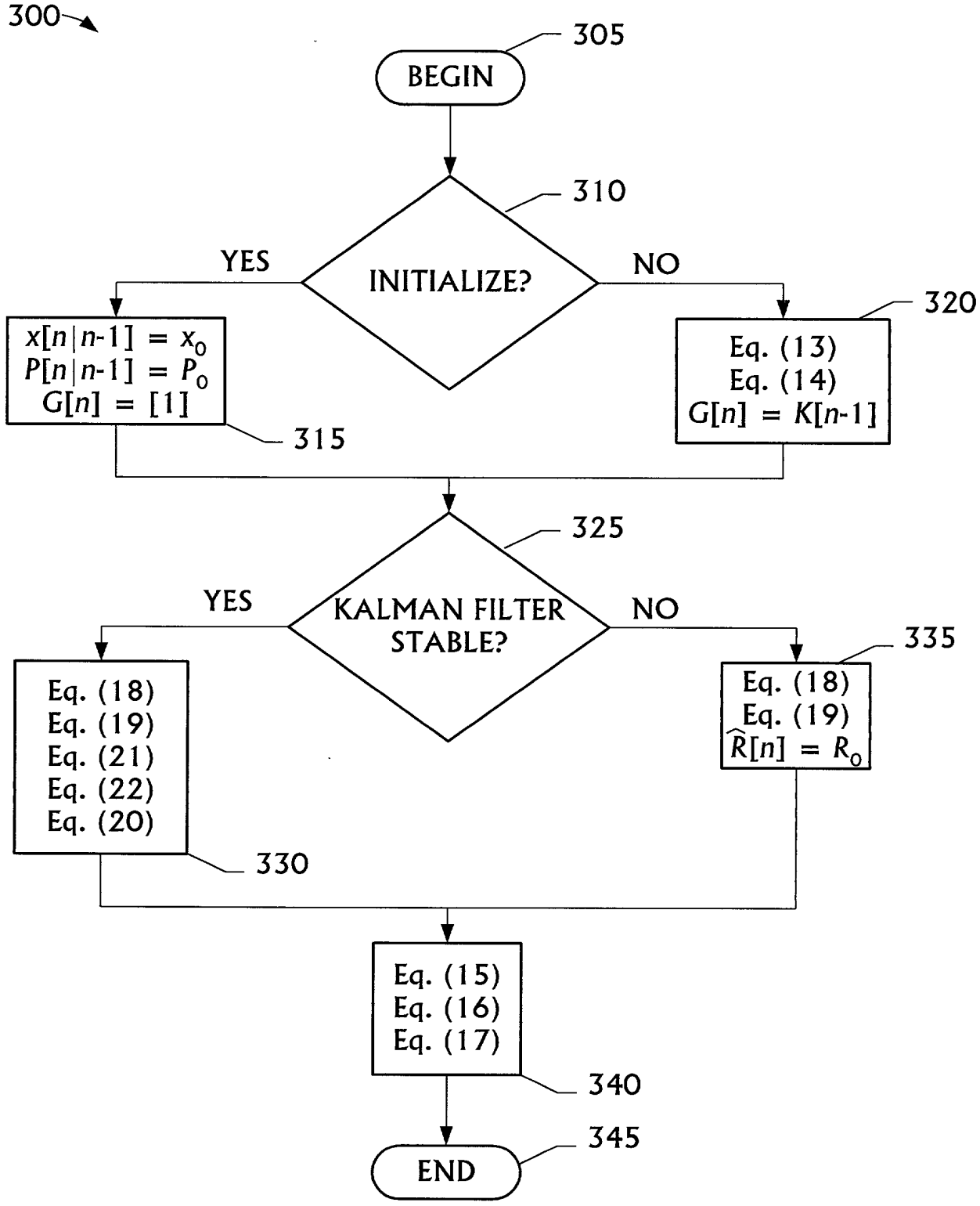
300
305
BEGIN
310
INITIALIZE?
YES
NO
$x[n|n\text{-}1] = x_0$
$P[n|n\text{-}1] = P_0$
$G[n] = [1]$
315
320
Eq. (13)
Eq. (14)
$G[n] = K[n\text{-}1]$
325
KALMAN FILTER STABLE?
YES
NO
Eq. (18)
Eq. (19)
Eq. (21)
Eq. (22)
Eq. (20)
330
335
Eq. (18)
Eq. (19)
$\hat{R}[n] = R_0$
Eq. (15)
Eq. (16)
Eq. (17)
340
345
END

FIG. 3

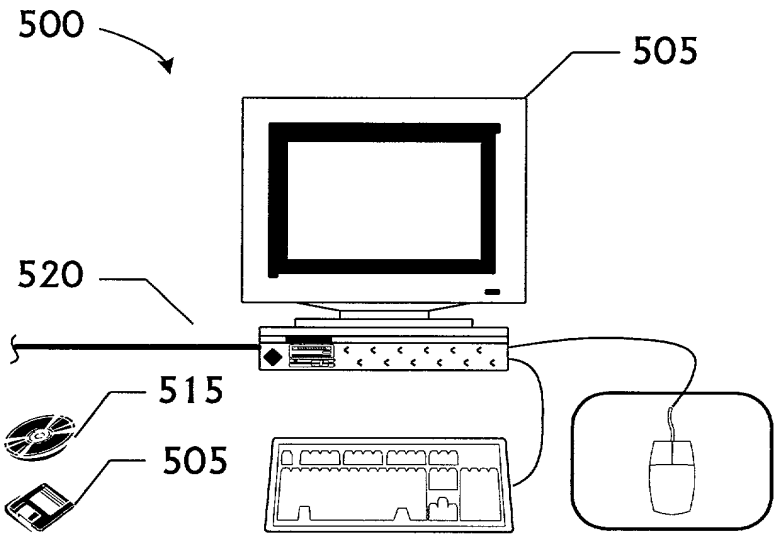
500
505
520
515
505

FIG. 5

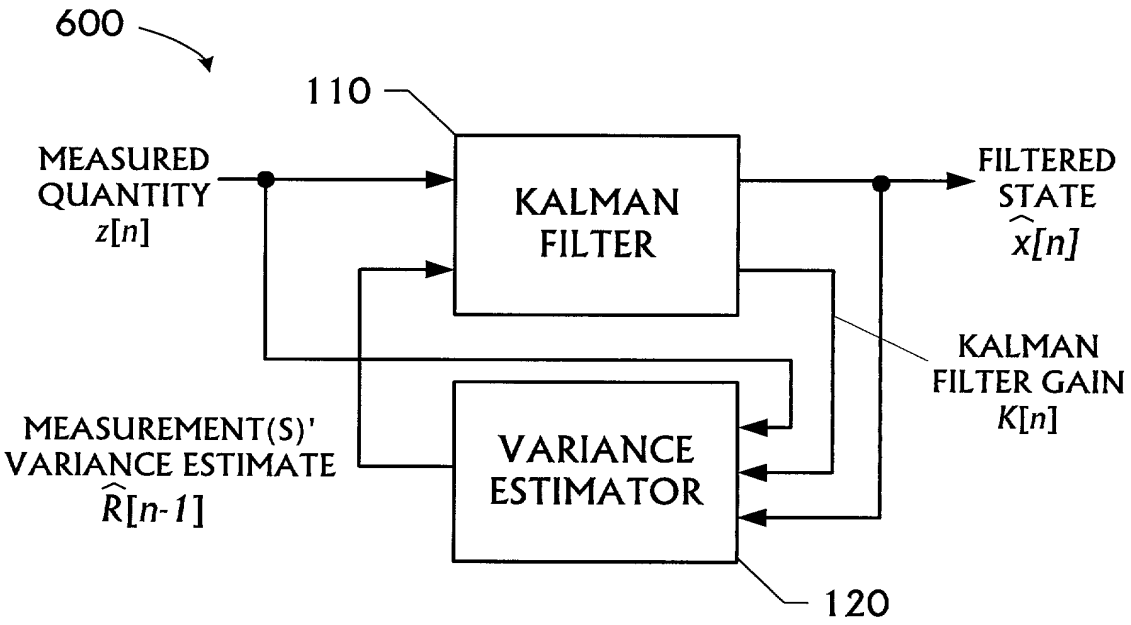
600
110
MEASURED QUANTITY
z[n]
KALMAN FILTER
FILTERED STATE
x̂[n]
KALMAN FILTER GAIN
K[n]
MEASUREMENT(S)' VARIANCE ESTIMATE
R̂[n-1]
VARIANCE ESTIMATOR
120

FIG. 6

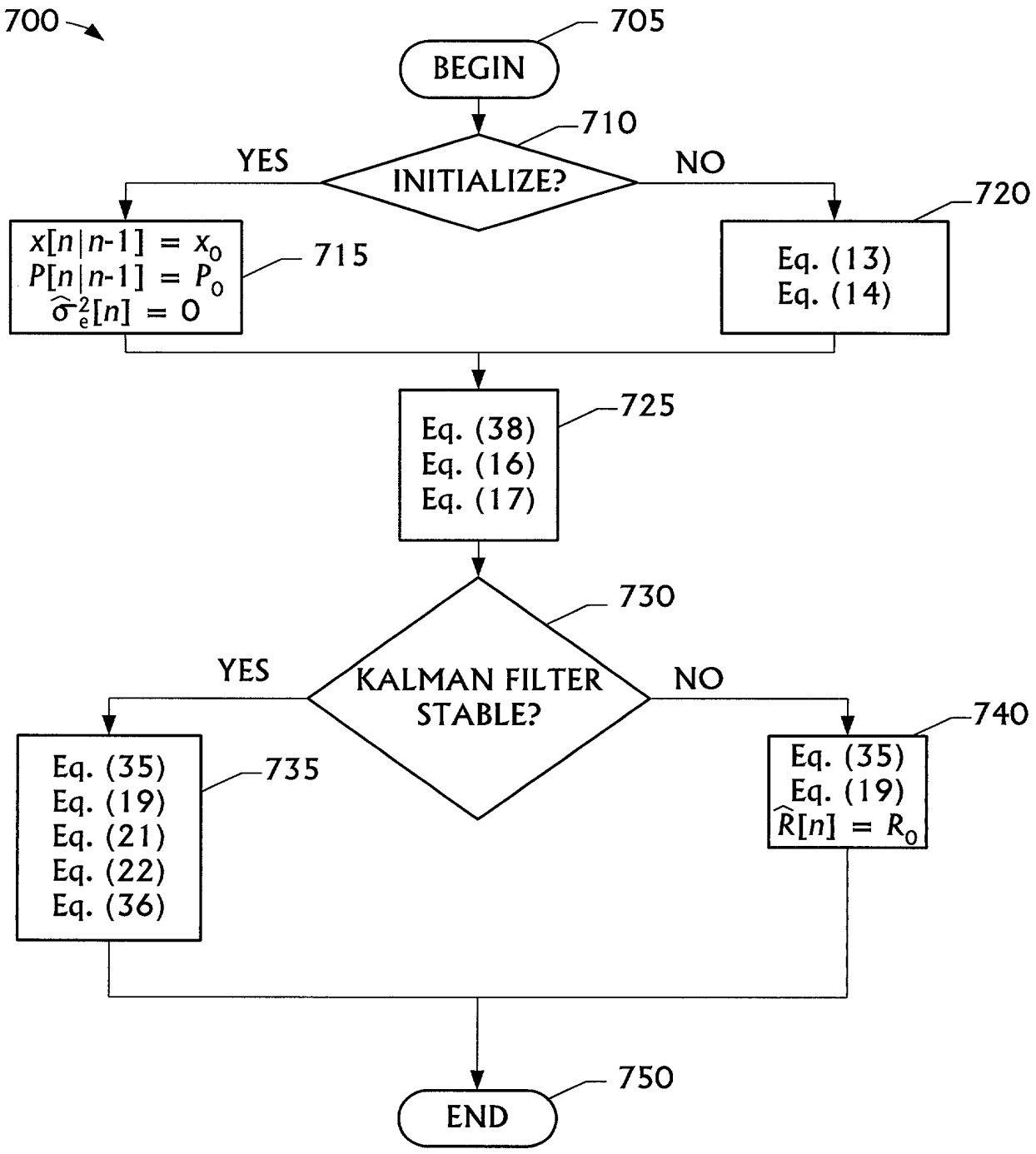
700
705
BEGIN
710
INITIALIZE?
YES
NO
720
$x[n|n\text{-}1] = x_0$
$P[n|n\text{-}1] = P_0$
$\hat{\sigma}_e^2[n] = 0$
715
Eq. (13)
Eq. (14)
725
Eq. (38)
Eq. (16)
Eq. (17)
730
KALMAN FILTER STABLE?
YES
NO
740
Eq. (35)
Eq. (19)
Eq. (21)
Eq. (22)
Eq. (36)
735
Eq. (35)
Eq. (19)
$\hat{R}[n] = R_0$
750
END

FIG. 7

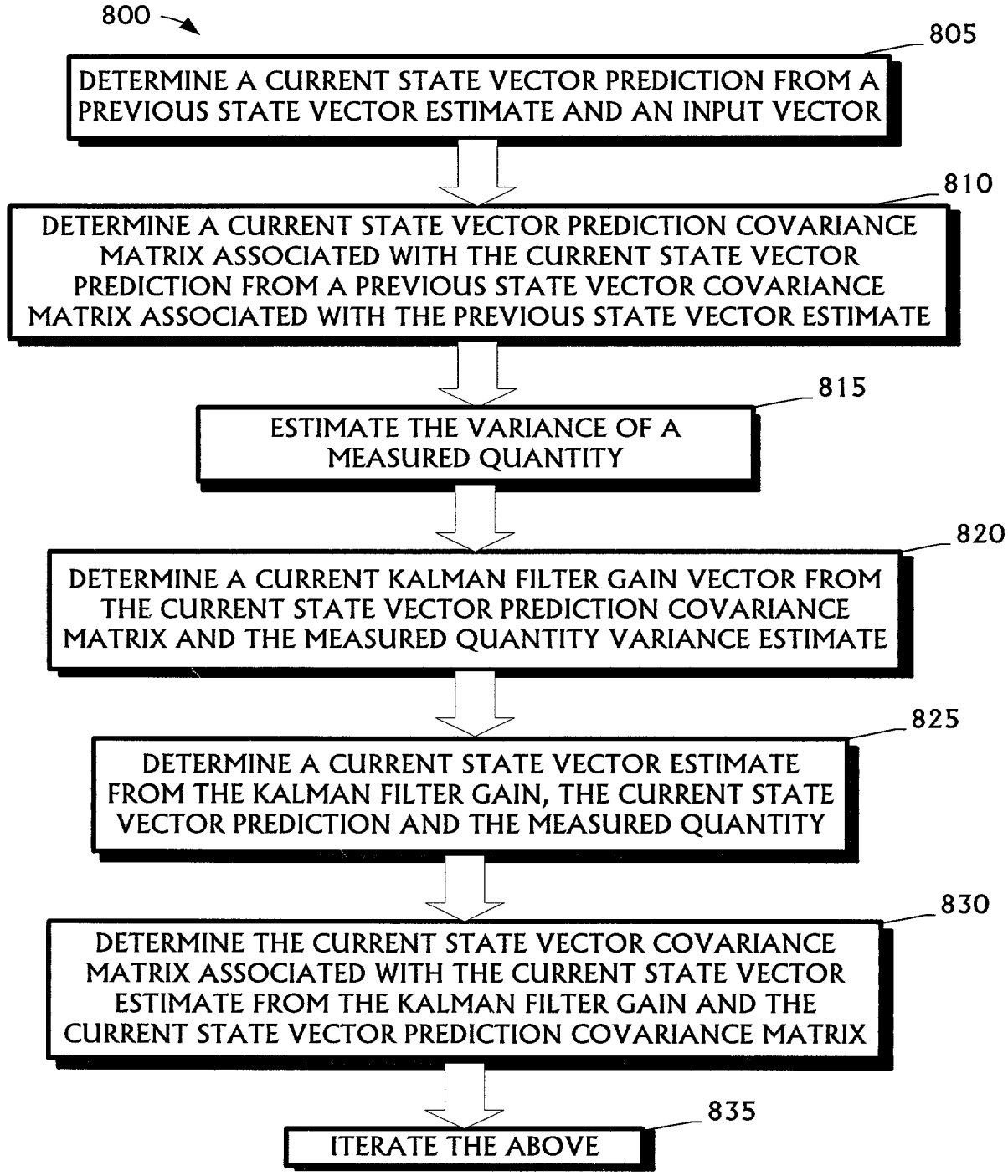
800
805
DETERMINE A CURRENT STATE VECTOR PREDICTION FROM A PREVIOUS STATE VECTOR ESTIMATE AND AN INPUT VECTOR
810
DETERMINE A CURRENT STATE VECTOR PREDICTION COVARIANCE MATRIX ASSOCIATED WITH THE CURRENT STATE VECTOR PREDICTION FROM A PREVIOUS STATE VECTOR COVARIANCE MATRIX ASSOCIATED WITH THE PREVIOUS STATE VECTOR ESTIMATE
815
ESTIMATE THE VARIANCE OF A MEASURED QUANTITY
820
DETERMINE A CURRENT KALMAN FILTER GAIN VECTOR FROM THE CURRENT STATE VECTOR PREDICTION COVARIANCE MATRIX AND THE MEASURED QUANTITY VARIANCE ESTIMATE
825
DETERMINE A CURRENT STATE VECTOR ESTIMATE FROM THE KALMAN FILTER GAIN, THE CURRENT STATE VECTOR PREDICTION AND THE MEASURED QUANTITY
830
DETERMINE THE CURRENT STATE VECTOR COVARIANCE MATRIX ASSOCIATED WITH THE CURRENT STATE VECTOR ESTIMATE FROM THE KALMAN FILTER GAIN AND THE CURRENT STATE VECTOR PREDICTION COVARIANCE MATRIX
835
ITERATE THE ABOVE

FIG. 8